United States Department of the Interior

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In Reply Refer To:
FWS/R2/OKES/
2008-F-0208

July 16, 2008

Gary D. Corino
Federal Highway Administration
300 North Meridian Avenue, Suite 105-S
Oklahoma City, Oklahoma 73107

Dear Mr. Corino:

This document transmits the U.S. Fish and Wildlife Service's (USFWS) programmatic biological opinion (PBO) based on our review of the Federal Highway Administration's (FHWA) and Oklahoma Department of Transportation's (ODOT) programmatic biological assessment (PBA) regarding highway construction activities undertaken in eastern Oklahoma and effects to the American burying beetle (ABB, *Nicrophorus americanus*) from these activities. Your request for formal consultation was received on June 4, 2008.

The USFWS has prepared this PBO in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.) and 50 Code of Federal Regulations [CFR] §402 of the interagency regulations governing section 7 of the Act. Section 7(a)(2) of the Act requires federal agencies to consult with the USFWS to insure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any federally listed species nor destroy or adversely modify critical habitat.

This PBO is based on information provided in the FHWA's and ODOT's May 29, 2008, PBA, the best available scientific and commercial data available, telephone conversations, electronic mail communications, and other sources of information. A complete administrative record of this consultation is on file at the USFWS's Oklahoma Ecological Services Field Office.

All reasonably foreseeable bridge replacement/maintenance and new highway construction or existing highway maintenance/upgrades that are projected to occur on an annual basis for the next five years within the ABBs range in Oklahoma are addressed in this PBO. Counties known to support ABB populations within eastern Oklahoma are depicted in Appendix 1.

Projects that are not consistent with, but similar to, those covered in this PBO may be appended to this PBO only as the USFWS deems appropriate. For example, the USFWS may elect to treat a project under this PBO that differs from the design criteria, but is similar in nature, scope, and effect to the described design criteria, and is implemented in a manner consistent with the process described in this PBO.

This PBO evaluates bridge and road construction projects at the program or landscape level. The Act's implementing regulations require that a PBO that addresses an overall plan, but lacks individual project level information, such as the date, location, and acreage, must require completion of project level consultation prior to individual project implementation. The courts have ruled that both general plans that guide the implementation of future individual actions, as well as each future individual action itself, must fulfill the requirements of section 7 consultation. In addition, the FHWA is responsible for making sure that individual projects comply with this PBO and that the specified incidental take level is not exceeded. Consequently, the FHWA or their designated representative, ODOT, must submit written individual project documentation to the USFWS for approval prior to project implementation as stipulated in the Reasonable and Prudent Measures. The USFWS will re-evaluate this PBO annually to make sure that its continued application will not result in unacceptable negative effects to the ABB.

Consultation History

Informal consultation among the FHWA, ODOT, and USFWS began in late 2004. On December 16, 2004, the USFWS, ODOT, and FHWA initially met to discuss the most appropriate way, through section 7 consultation, to address the impacts of ODOT and FHWA projects on the ABB. The USFWS outlined the section 7 consultation process, how this process could be streamlined, and how FHWA could best meet their responsibilities under section 7(a)1 and section 7(a)2 of the Act. The participating agencies agreed that a programmatic approach served the best interests of all parties, and that the best avenue to conserve and protect the ABB over the long-term was to develop a conservation strategy for the ABB.

On January 20, 2005, the USFWS met with representatives from the FHWA and the ODOT to discuss the ABB conservation strategy. The USFWS outlined data gaps in the knowledge of ABB life history and important recovery actions. Further discussion ensued regarding how addressing the lack of information would not only provide long-term benefit to the ABB, but also facilitate the implementation of transportation projects. The group then focused on addressing those data gaps that would provide FHWA and ODOT with better means to avoid take of the ABB and ensure a net conservation benefit. The USFWS explained that the prevailing theory on the decline of the ABB was habitat loss, degradation, and fragmentation. Consequently, research providing information on habitat requirements, along with acquisition of essential habitat, was of prime importance to conserving and recovering the ABB.

Due to FHWA internal reorganization, further discussions regarding programmatic consultation lapsed until early 2007. However, interim project level consultation guidance was developed. The USFWS analyzed the existing ABB survey data and determined that disturbance greater than 1.2 acres would likely adversely impact the ABB. In these instances, the USFWS recommended implementation of ABB avoidance measures in the form of presence/absence surveys, and trapping and relocation or baiting away procedures to minimize the potential for take. Since June of 2007, this consultation guidance has been implemented by FHWA and ODOT.

On February 13, 2007, the USFWS again met with FHWA and ODOT representatives to further discuss programmatic consultation. The USFWS, FHWA, and ODOT agreed that project-by-project consultation requires a great deal of time and fiscal resources. Further, while survey data provided valuable information regarding the distribution of ABBs in Oklahoma, they yielded

small and disjunct conservation benefits that contributed little to the viability of ABBs and their habitat. The group agreed that an integrated and comprehensive consultation and conservation approach would provide greater aid to ABB recovery, while streamlining the consultation process for transportation projects in eastern Oklahoma.

Specific details regarding the programmatic consultation process, document development, individual agency responsibilities, timeframes, and related matters were discussed. The USFWS explained the Act required ODOT and FHWA to prepare a PBA detailing the annual transportation activities that could potentially impact ABBs, and their proposed conservation measures. The USFWS agreed to develop the ABB Conservation Strategy for Oklahoma (Conservation Strategy).

Monthly meetings or conference calls were held among ODOT, FHWA, and the USFWS from March 2007 through May 2008 to discuss the ongoing development of the PBA, the PBO, and to address conservation needs of the ABB.

Representatives from the USFWS, ODOT, and The Nature Conservancy (TNC) of Oklahoma met on October 17, 2007; January 11, 2008; February 12, 2008; and March 11, 2008, to discuss priority areas for habitat conservation and the implementation and monitoring of the Conservation Strategy.

The USFWS received a draft PBA from the ODOT at a meeting held on April 16, 2008. The USFWS provided written comments and submitted these to the ODOT on April 21, 2008. The USFWS received an updated draft PBA on May 1, 2008. The USFWS and ODOT discussed this draft during their May 6, 2008, meeting.

On June 4, 2008, the USFWS received a Final PBA on transportation projects in eastern Oklahoma affecting the ABB and a written request to initiate formal consultation from the FHWA. On June 17, 2008, the USFWS notified the FHWA that the PBA was complete and that formal consultation was initiated on the date we received the PBA.

BIOLOGICAL OPINION

I. Description of Proposed Action

This PBO concerns all reasonably foreseeable bridge replacements and maintenance, and new highway construction or existing highway maintenance/upgrades that would occur on an annual basis for the next five years (2008 - 2012) in 34 counties of eastern Oklahoma (Appendix 1).

There are three types of projects included in the proposed action: State System, County Improvements for Roads and Bridges (CIRB), and Local Government (LG). The State System includes State, Federal and Interstate highway improvement projects recommended through an annual validation and consideration process led by ODOT's eight Field Division Engineers and approved by the Transportation Commission. These projects are incorporated into an eight-year construction plan - 2007-2014 (State Plan). The State Plan includes both Federal-aid funded and state funded transportation projects, and includes both new construction and rehabilitation of existing structures.

The CIRB five year construction work plan encompasses high priority improvements to the county transportation systems between 2008 and 2012. The CIRB plan was developed through coordination with the County Commissioners, along with the assistance provided by their respective Circuit Engineering Districts. Projects included in the CIRB plan consist of the highest priority, most critical projects as identified and validated by the cooperative project recommendation, selection and approval process. Local government construction projects include those county projects expected to be constructed between 2008 and 2012, but that are not included in the CIRB.

Based upon the State Plan, the CIRB, and other known LG projects, 443 new bridge and road projects are estimated to be proposed for construction over the next five years (2008-2012) within counties known or reasonably likely to support ABBs. The number of projects likely will change as projects are added and/or subtracted from the project list on an annual basis. The project types range from county road bridge replacements to construction of a four-lane interstate bypass on new alignment. Our evaluation of projects is intended to be conservative, meaning that the estimate of the area of project disturbance is most likely an overestimate rather than an underestimate. Not all projects encompassed by the proposed actions will affect ABBs or their habitat (e.g., bridge painting, purchase of ROW, striping) and only those that would potentially adversely affect ABBs were used to estimate the likely amount of habitat to be disturbed as a result of highway projects.

For projects on new alignment, the total potential disturbance area was calculated based on standard right-of-way (ROW) widths for the type of construction and the total length of the project. For existing projects, the potential new disturbance area was defined as the existing transportation corridor's ROW multiplied by the total length of the project, minus the existing paved surface already present. For most of the proposed actions, the actual areas of ground disturbance would be limited to the project footprint, an area usually considerably smaller than the total width of the ROW. However, the actual amount of ground disturbance is not usually known. The project area was defined as the entire ROW or the ROW minus the existing pavement to provide a conservative estimate of the total ground disturbance.

The ABB is a foraging habitat generalist (see status of the species section below) and believed to be a reproductive habitat specialist. However, environmental characteristics that constitute suitable ABB reproductive habitat are not fully understood. The USFWS has stated that consistently maintained existing ROWs would be unlikely to provide suitable ABB reproductive habitat. Additionally, if all carrion is removed from the existing ROW at least two days prior to and during the performance of ground disturbing activities, these areas would not provide suitable foraging habitat for the ABB (USFWS 2005a). The following environments also are considered unlikely to be utilized by the ABB: 1) developed land that no longer exhibits surficial topsoil (such as existing pavement, gravel-surfaced roadway, sidewalks, etc.); 2) soil with a sand or clay content equal to or greater than 70%; 3) land where greater than 80% of the upper four inches of soil is composed of rock; 4) agricultural land that is tilled at least once per year; 5) land with an artificially maintained near-monoculture (greater than 80% vegetative coverage) of a non-native species, such as Bermuda grass; and 6) land that meets the United States Army Corps of Engineers definition of a wetland (USFWS 2005b).

Scope and Scale of Proposed Actions and Timeframe for Implementation

Although the exact number and types of projects that will be undertaken over the next five years cannot be precisely known at this time, the list of projects proposed for construction in 2008 is mostly complete. For the purpose of estimating the maximum effect on the ABB from all transportation projects for the next five years, the numbers and types of projects proposed for 2008 were extrapolated through 2012.

Table 1. Estimated total number and type of transportation projects projected for construction, with the maximum acreage of impact, between 2008 and 2012.

Project Type Description	Total Number of Projects	Total Project Length (miles)	Total Project Area (acres)
Bridges & Approaches	330	118.10	2024.1
Grade, Drain & Surface	55	183.10	3232.44
Grade, Drain, Bridge & Surface	23	52.68	1114.08
Enhancement	15	15.13	65.15
Surface & Resurface	15	54.00	675.63
Landscaping	5	0.10	1.66
TOTAL	443	376.08	5998.98

The FHWA/ODOT's PBA proposes up-front, proactive conservation measures designed to compensate for improvements on new and existing statewide and local government transportation projects in eastern Oklahoma. These conservation measures are discussed below.

List and Description of Project Types that May Affect ABB

Roadway Construction on New Alignment. Construction activities for a typical roadway on a new alignment involve clearing vegetation; removing topsoil, rocks, and rooted debris; grading to level the site; placement of culverts, bridges, water diversionary control structures, and erosion control structures; laying gravel, and/or rock over the graded surface; and finally overlaying with asphalt and/or concrete. Land clearing and grading of the construction area, as well as the other measures stated above, are conducted with a bulldozer or other heavy equipment. During routine roadway construction, soil is excavated to a depth of about 12 inches, but may exceed 12 inches depending upon terrain and presence of rooted vegetation, rocks, etc. Topsoil is scraped from the construction area and is often stored in the construction site for use during other phases of the project. Vegetation debris piles are stored along the edges of the construction site and typically removed after construction operations are completed.

The ROW of a four lane or interstate grade roadway is typically 200 to 300 feet wide, but varies depending upon the gradient of the surrounding landscape. Two lane undivided highways can have ROW widths between 80 and 140 feet wide, depending upon the designation of the highway. County roads typically have ROW widths varying from 33 to 66 feet. In some cases, borrow pits are excavated near construction sites for additional soil, gravel, and/or rock to aid in

leveling the ROW. The pits vary in size but can be as large as several acres. Once constructed, the resulting roadway is a permanent installation; ROW adjacent to roadbeds and medians are revegetated and maintained at least annually on state and US highways. Rights-of-way on county roads usually are not maintained. If maintained, mowing rarely occurs more than once annually.

Roadway Construction on Existing Alignment and Widening Projects. Overlays and maintenance projects on existing alignments do not typically involve additional soil disturbance. Widening projects are usually undertaken to upgrade two lane highways to four lanes or to add passing lanes or shoulders to narrow roadways. Current standards call for shoulders in each direction of travel varying from four to 12 feet, depending on the facility type, location, and traffic. Shoulders are four to six feet wide when adjacent to auxiliary lanes, eight to 10 feet along rural highways, and 10 to 12 feet along interstates. Widening consists of earthwork, drainage, base course addition, surfacing with asphalt or concrete, landscaping, pavement marking, and, if necessary, guardrail addition.

Bridge Replacement and Rehabilitation. Bridge projects are by far the most prevalent project type proposed over the next five years in the State Plan, CIRB and LG. Bridges are most often constructed directly adjacent to existing structures, but may be on new alignments as a result of geographic constraints or construction of new roadways. Areas of soil disturbance range from one to five acres in most instances. Land preparation for bridge construction is similar to that described for roadway construction on new alignment. Additionally, topsoil or other similar material, is often brought to the construction site to satisfy grade requirements and achieve proper elevation. Large boulder or rip rap also is commonly used below bridge abutments to stabilize topsoil that may be exposed to flowing water. Bridge replacement consists of the removal of the old bridge and replacing with a new structure that may be wider than the existing structure, if traffic volumes are projected to be higher. Details of bridge construction depend upon site-specific traffic and environmental characteristics.

Reconstruct Added Lanes. Lane addition (i.e., added capacity, acceleration/deceleration lanes, and truck climbing lanes) involves earthwork, drainage work, base course addition, surfacing with either asphalt or concrete, pavement marking, signing, and oftentimes guardrail placement.

Interchanges. Interchange construction or reconstruction generally consists of adding an overpass or underpass as a means of crossing existing roadways. Newly constructed or reconstructed overpasses or underpasses usually have four ramps as well as necessary lighting, signing, and signalization in order to meet increased traffic volumes on the intersecting roadways. These activities are more likely to occur in urban areas.

List and Description of Project Types That Are Not Likely to Affect the ABB.

The following types of proposed projects are not expected to impact the ABB, either because of the limited nature of the projects, or because suitable ABB habitat generally does not occur within the footprint of these projects

Intersection Modification & Traffic Signals. Intersection improvements consist of adding or improving the signalization, signing, lighting, pavement marking, and/or sight distances.

They may also entail separating traffic with medians, and/or constructing through traffic or turn lanes. These activities generally occur in urban areas.

Landscaping. There is one landscaping project listed in the State Plan and involves planting vegetation in the median.

Action Area

The total Action Area occupies approximately 28,623 square miles (over 18 million acres) and includes portions of 10 Level III ecoregions (Woods, *et al.* 2005). Elevation ranges from 287 feet in the southeast portion of the Action Area to 1,000 feet above sea level in the northwest portion. The current range of the ABB within the Action Area is dominated by the Osage Cuestas (an irregular to undulating plain) of the Central Irregular Plains, the Arkansas Valley, the Ouachita Mountains, and the South Central Plains ecoregions. The natural vegetation varies and consists of areas of tall grass prairie, oak woodland, oak-hickory forest, oak-hickory-pine forest, oak savanna, and scrubby oak forest.

Ecoregion descriptions below were derived from Duck and Fletcher (1943) and Woods, *et al.* (2005).

Ozark Highlands (2,380 mi^2). The Ozark Highlands ecoregion is a level to highly dissected plateau composed of flat-lying, cherty limestone. Mean annual precipitation in this humid region is 41 to 49 inches. The growing season ranges from 200 to 215 days. Soils are very shallow, rocky, well drained, very strongly acid-humus-poor on steep slopes (27%). Oak-hickory forests and limited oak-hickory-pine forests are native on uplands. Today, rugged areas generally are wooded and nearly level sites are used as pastureland or hayland.

Karst features, such as sinkholes and caves, are common in the Springfield Plateau portion of the ecoregion. Historically, uplands of the Springfield Plateau were dominated by oak-hickory forest and savannahs, with fire-maintained tallgrass prairies. Today, much of the forest, and nearly all of the prairie, has been replaced by agriculture or expanded residential areas. The Elk River Hills is composed of narrow ridgetops and intervening, steep V-shaped valleys. Carbonate rocks, along with associated karst features, are typical. Natural upland vegetation is oak-hickory and oak-hickory-pine forests and woodlands.

Boston Mountains (838 mi^2). The Boston Mountains region is a deeply dissected, mountainous plateau composed of sandstone and shale, and mostly covered by a mosaic of forest and woodland types. Mean annual precipitation in this humid ecoregion varies from 44 to 51 inches, and increases eastward. The growing season ranges from 200 to 220 days. Soils are generally medium textured, stony and shallow. Natural vegetation is oak-hickory forest. The ecoregion remains mostly forested. Flatter areas, however, are used as pastureland or hayland.

Arkansas Valley (4,824 mi^2). The Arkansas Valley separates the Ozark Plateau from the Ouachita Mountains to the south. This ecoregion is characteristically transitional and diverse. Plains, hills, floodplains, terraces, and scattered mountains all occur. The terrain, however, is distinct from either neighboring ecoregions. Annual average precipitation is 44 to 50 inches. The growing season lasts 200 to 240 days. Soils are variable in characteristics, ranging from shallow to deep, but most are well drained. Soil moisture is adequate for plant growth during

most of the growing season. A mix of oak savanna, prairie, oak-hickory-pine forest, and oak-hickory forest is native on uplands. Bottomland forest is native on floodplains and low terraces. Much of the floodplain and other areas of deeper, productive soil are used for crops.

The Scattered High Ridges and Mountains portion is covered by savannas, open woodlands, or forests dominated or co-dominated by upland oaks, hickory and shortleaf pine. Loblolly pine also occurs, however, it is not native. The Arkansas River Floodplain is veneered with alluvium and includes natural levees, meander scars, oxbow lakes, point bars, swales, and backswamps. The Arkansas Valley Plains, once covered by a distinctive mosaic of savanna, woodland, forest and prairie, today consists mostly of pastureland or hayland. But its scattered hills and ridges remain wooded. The Lower Canadian Hills acts as a transition between the drier Cross Timbers to the west and moister parts of the Arkansas Valley to the east. Native vegetation is a mixture of oak woodland, tallgrass prairie, oak-hickory forest, and oak-hickory-pine forest.

Ouachita Mountains (4,073 mi^2). The forested low mountains of this ecoregion are characteristically underlain by folded, sedimentary rocks of Paleozoic age. Mean annual precipitation in this humid ecoregion is 43 to 57 inches. The growing season ranges from 190 to 230 days, with average frost free days being the shortest in protected valleys and in the eastern portion of the ecoregion. On steep slopes (30%), soils are well to moderately well-drained. On moderately steep slopes (8%), soils are moderately well-drained and acid to silty loam. Oak-hickory-pine forest is native on uplands. This ecoregion remains mostly forested, but pastureland and hayland occur in wider valleys.

The Athens Plateau of the Ouachita Mountains is composed of open hills and low ridges that are widely underlain by Mississippian Stanley Shale. In the Central Mountain Ranges shallow, stony soils are common and support oak-hickory-pine forest. Ridges are steep enough to limit logging. This area contains the largest remaining tract of un-logged, old growth oak-pine habitat in the U.S. Its pine woodlands are managed to increase the population of the endangered red-cockaded woodpecker. The Fourche Mountains are composed of east to west trending, folded, sandstone-capped ridges and intervening shale valleys. Natural vegetation is oak-hickory-pine forest. Forests on steep, north-facing slopes are more mesic than on southern aspects. Steepest, south-facing slopes with shallow, moisture deficient soils support shrubs and rocky glades. Pastureland and hayland are restricted to broad valleys. The low mountains, hills and valleys of the Western Ouachitas are covered with oak-hickory-pine forest, and largely underlain by sandstone and shale. Natural vegetation of the broad Western Ouachita Valleys is oak-hickory-pine forest on uplands and bottomland forest on floodplains and low terraces. Prairies also occurred prior to the 20th century.

South Central Plains (2,625 mi^2). The South Central Plains is an irregular, forested plain cut by shallow valleys and underlain by poorly-consolidated deposits. Mean annual precipitation in this humid region varies from 45 to 55 inches, and increases eastward. This region occupies the edge of the southern coniferous forest belt. The growing season averages 215 to 235 days. Soils vary from deep clayey and humus-rich on gentle slopes (7%), very deep loamy and well drained soils on gentle slopes (6%), very deep and strongly acid soils on steep slopes (12%), very deep somewhat poorly drained and strongly acid soils on nearly level slopes (1%), and very deep clayey, moderately well drained, mildly alkaline and humus-rich soils on level areas. Natural vegetation is oak-hickory-pine forest on uplands and southern floodplain forest on bottomlands. Prairies once occurred on soils derived from limestone, marl, and calcareous shale. Today,

uplands are largely pastureland or forest dominated by shortleaf pine, loblolly pine, oaks, and hickories. Poorly-drained floodplains support bottomland forests and wetlands. Cropland is most extensive along the Red River.

The Floodplains and Low Terraces portion of the ecoregion is nearly level, susceptible to flooding, and veneered by alluvium. This portion includes natural levees, swales, terraces, and slowly moving streams in meandering, low gradient channels. Oxbow lakes and forested wetlands are common with distinct flora and fauna. The Pleistocene Fluvial Terraces are nearly level, periodically wet, and characteristically veneered by unconsolidated Pleistocene terrace deposits. The lowest terrace is clayey and supports hardwood wetlands. Higher terraces are dominated by pine flatwoods; however, pastureland and hayland also occur. The level to hilly Cretaceous Dissected Uplands are mostly underlain by calcareous sands, clays, and gravels. Natural vegetation is mostly oak-hickory-pine forest. The nearly flat Red River Bottomlands are veneered with Holocene alluvium and have been widely cleared and drained for agriculture. This ecoregion contains floodplains, low terraces, oxbow lakes, meander scars, backswamps, levees, drainage ditches, and the Red River. Natural vegetation is southern floodplain forest. The level to rolling Blackland Prairie has deep, dark soils derived from underlying limestone, marl, and calcareous shale.

Central Irregular Plains (5,211 mi^2). The Central Irregular Plains is a belt of prairie that separates the Cross Timbers from the forests of the Boston Mountains and Ozark Highlands. Interbedded Pennsylvanian-age shale, sandstone, limestone, and coal occur. The alternating hard-soft strata dip westward, forming nearly flat to irregular plains, low hills, and east-facing cuestas. Average annual precipitation ranges from 39 to 45 inches in this humid ecoregion and increases southward and eastward. The growing season ranges from 200 to 225 days, increasing southward through the ecoregion. Soils are clayey and loamy on 3% slopes, or clayey and silty and humus-rich on 6% slopes. Natural vegetation is mostly tall grass prairie, but forests and woodlands - dominated by post oak, blackjack oak, and black hickory - are native on stony hilltops. Today, this region is a mix of native rangeland, introduced grassland, upland woodland, floodplain forest, and farmland. Cropland is most extensive on nearly level plains.

The Osage Cuestas, an irregular to undulating plain, comprises the largest portion of the Central Irregular Plains in Oklahoma. Natural vegetation is mostly tall grass prairie, but a mix of tall grass prairie and oak-hickory forest is native to eastern areas. Today, rangeland, cropland, riparian forests, and on rocky hills, oak woodland or oak forest occur. The smaller Cherokee Plains is a nearly flat erosional plain that is dominated by clayey, slowly permeable soils. Claypans occur and impede percolation drainage. Natural vegetation is mostly tall grass prairie. Today, the ecoregion is mostly cropland. Rangeland occurs on steeper slopes and riparian areas are wooded.

Flint Hills (797 mi^2). The Flint Hills includes the western edge of tall grass prairie in Oklahoma. Its grass-covered, open, low hills, cuestas, and plains are underlain by cherty limestone and shale. Mean annual precipitation is 38 to 42 inches and the mean annual frost free days range from195 to 205. The natural vegetation is primarily tall grass prairie, dominated by big bluestem, little bluestem, switchgrass and Indiangrass. On moisture deficient soils, short grasses such as blue grama, side-oats grama and hairy grama, as well as prickly pear, occur. In the narrow riparian areas, bottomland forests containing cottonwood, hackberries, elms and oaks are common.

Cross Timbers (6,910 mi^2). The Cross Timbers consists of a mix of savanna, woodland, and prairie, and separates the forests of the east from the prairies of the drier west. Climatic conditions in this region are characterized as subhumid, mesothermal with average precipitation ranging from 32 to 42 inches annually. The growing season averages 195 to 225 days. Soils vary from moderately acidic and humus-poor on steep slopes (18%) to shallow, rocky and humus-rich on gentle slopes (5%).

The hills, cuestas, and ridges of the Northern Cross Timbers are naturally covered by a mosaic of oak savanna, scrubby oak forest, eastern red cedar on porous, course-textured soils derived from sandstone, and tall grass prairie on fine-textured soils derived from limestone or shale. Soils are highly erodible when disturbed. The rolling hills, cuestas, and ridges of the Eastern Cross Timbers are naturally covered by oak savanna, scrubby oak forest, eastern redcedar, and tall grass prairie, and are underlain by sand, shale, clay, sandstone, calcareous shale, and limestone. Post oak and blackjack oak are dominant on sandy soils while finer soils support grasses. Tall grass prairie and oak savanna are native to the rolling hills and plains of the Arbuckle Uplift, and developed over a unique mosaic of limestone, granite, dolomite, sandstone, and shale. Upland soils that were derived from limestone are usually shallow, moisture deficient, and erodible if disturbed.

The Cross Timbers Transition consists of rough plains that are covered by prairie grasses and eastern redcedar, scattered oaks, and elms. Terrain and vegetation are transitional between the less rugged, grass-covered regions to the west and the hilly, oak savannas to the east.

East Central Texas Plains (364 mi^2). The East Central Texas Plains ecoregion is composed of plains with fine-textured soils and claypans. Mean annual precipitation in this moist-subhumid region ranges from 42 to 45 inches. The growing season ranges from 230 to 235 days. The portion of the ecoregion in Oklahoma is characterized by level to rolling plains, extensive clay flats, and slowly to very slowly permeable soils that were derived from Cretaceous-age plastic shale, marl, limestone, sand, and gravel, which are deep clayey and humus-rich on gentle slopes (7%). Tall grass prairie and oak savanna are native. Cropland and pastureland are now common.

Central Great Plains (625 mi^2). The Central Great Plains, in Oklahoma, are largely underlain by red, Permian-age sedimentary rocks and include scattered hills, breaks, salt plains, low mountains, gypsum karst, sandy flats, and sand dunes. Mean annual rainfall ranges from 29 to 38 inches and increases eastward. The growing season ranges from 205 to 225 days annually. Soils are clayey and silty and humus-rich on gentle slopes (6%), and clayey on very gentle slopes (4%). Mixed grass prairie, cross timbers, and tall grass prairie comprise the natural vegetation. Riparian corridors support hardwood forest. Today, scattered oaks, hickories, and increasingly, eastern redcedar occur on uplands. Only 2% of this ecoregion occurs within the Action Area.

Conservation Measures

Conservation Measures, when used in the context of the Act, represent actions pledged in the project description that the action agency or the applicant will implement to further the recovery of the species under review. The beneficial effects of the conservation measures are taken into consideration for both jeopardy and incidental take analyses.

The USFWS, ODOT, and FHWA have worked closely in evaluating impacts to the ABB from transportation activities, developing measures to avoid and minimize adverse impacts to the ABB, streamlining consultation, facilitating project implementation, and aiding in the recovery of the ABB. As a result of these efforts, project implementation guidelines and a Conservation Strategy have been developed by the USFWS. Through the Conservation Strategy the USFWS has identified priority conservation areas and recovery actions for the ABB in Oklahoma, as well as data gaps in the understanding of ABB life history (USFWS 2008).

Current Avoidance Measures Performed for Transportation Projects. Prior to consultation, the USFWS developed interim guidance for FHWA/ODOT to be used in avoiding adverse impacts to the ABB on a project-by-project basis in the short-term. These measures included detection surveys at the project site prior to ground disturbance, and trap-and-relocate or bait-away procedures when necessary. Surveys were conducted at each project site prior to and within one year of construction. If no ABBs were found, the ODOT concluded that the project would be unlikely to adversely affect the ABB. If the survey revealed the presence of ABBs, trap-and-relocation was performed, and the ODOT concluded that the project would be unlikely to adversely affect the ABB. All actions were performed in accordance with the protocols established by the Oklahoma Ecological Services Office of the USFWS. These protocols are available on the USFWS's ABB webpage http://www.fws.gov/southwest/es/oklahoma/beetle1.htm.

Detection surveys were conducted during the ABBs active period (mid-May to mid-September) for 3 consecutive nights using standard procedures accepted by the USFWS for ODOT projects. During 2007, 76 ABB surveys were conducted by the ODOT on 46 transportation projects at a cost of $175,000. Eight of the 46 projects had at least 1 transect with a positive result. Positive survey results were recorded for two projects each in Hughes, Okfuskee and LeFlore counties, and one project each in Johnston and Osage counties. Additionally, 10 projects had ABB trap and relocation conducted at a cost of $46,000. Only two of the 10 projects (one each in Pittsburg and Sequoyah counties) resulted in the capture and translocation of the ABB. In both cases only one individual was relocated.

Costs for surveys were based on the number of transects needed per project (e.g., 1 transect for projects 0.001 to 1 mile in length, 2 transects for projects 1.001 to 2 miles in length, 3 transects for projects 2.001 to 3 miles in length, etc.). During 2007, for 1 transect, costs were $1,000 for setup and $600 per night (for 3 nights) for a total of $2,800. For 2 transects, costs were $1,400 for setup and $800 per night for a total of $3,800. For 3 transects, costs were $2,100 for setup and $1,200 per night for a total of $5,700. For each additional transect over three transects at the same location, an additional $700 for setup and $400 per night were added for a total of $1,900. End-of-season trap and relocation was conducted at positive survey sites for six nights (September 20 - 25, annually) by using standard procedures outlined by the USFWS for the ODOT. Costs for trap and relocation were $1,000 for setup and $600 per night for a total of $4,600.

Proposed Impact Avoidance and Minimization Measures. The ODOT will attempt to minimize disturbance to areas outside of the required construction footprints of the proposed projects whenever practicable and feasible. Minimizing the construction footprint may be accomplished by reconstructing or rehabilitating (rather than completely replacing) some structures, constructing new bridges on their existing alignments and closing low volume roads

to through traffic (eliminating the need for "shoo-fly" detours), and where a temporary shoo-fly detour is necessary, limiting the length and breadth of the detour as much as possible. The majority of these projects, however, probably will include small amounts of new ROW to accommodate the proposed construction. Some projects may involve the acquisition of significant quantities of new permanent and/or temporary ROWs and new alignment construction. Although lower-impact alternatives will be considered in all cases, engineering design constraints, public safety, and the consideration of other environmental issues (such as the preservation of important cultural resources) may necessitate the construction of some facilities on new alignments.

Proposed projects will be constructed using strict best management practices (BMPs) for storm water, erosion and sediment control, and chemical/fuel handling measures (dictated by Federal Regulation and the ODOT's Standard Specifications for Highway Construction), and in full accordance with other applicable environmental permits and clearance mandated by state, federal and local agencies.

Proposed conservation measures. Based on the transportation projects listed in the State Plan, CIRB and known LG projects, and the cost and methodology of ABB detection surveys and removal procedures, the number and associated cost of ABB surveys and trap and relocations were projected for years 2008 through 2012. Table 2 reflects the cost that would reasonably likely to be expended over the next five years on individual projects, if the previous avoidance measures continued to be implemented. However, rather than continuing to conduct ABB surveys and trap and relocations on individual projects, FHWA/ODOT propose to provide a more long-term conservation effort for the ABB by contributing equivalent funds into an ABB Conservation Fund. The ABB Conservation Fund is a means for FHWA/ODOT to provide more meaningful conservation of ABBs in response to transportation network improvements in eastern Oklahoma that adversely impact the ABB. Funds in the ABB Conservation Fund would be expended on ABB research, land acquisition, conservation easements, or any other conservation measure determined by the USFWS to result in a net conservation benefit to the ABB. The amount paid into the ABB Conservation Fund will be adjusted annually according to the actual projects constructed during each year.

II. Status of the Species

A. Species/Critical Habitat Description

The ABB was proposed for federal listing in October 1988 (53 FR 39617) and designated as an endangered species on July 13, 1989 (54 FR 29652) and retains this status. Critical habitat has not been designated for the ABB. The draft recovery plan was issued on July 25, 1991, and the final recovery plan was signed on September 27, 1991. A five-year review of the listing status is currently being conducted by the USFWS.

The ABB has disappeared from over 90 percent of its historic range. The species currently is found in 28 counties and reasonably likely to occur in 6 other counties within eastern Oklahoma. The decline may be attributed to habitat loss, alteration, and degradation. The USFWS concluded that the likely explanation for the decline of ABBs involved an increase in edge

Table 2. Number of ABB surveys and associated costs for known transportation projects scheduled from 2008 to 2012. Five-year total not calculated because estimates likely will change by year as work progresses.

Year	Work Description	ABB survey Transects	Survey Costs	Estimated T&R required*	T&R Costs	Total Cost
2008	Bridges & Approaches	72	$191,700			
	Grade, Drain & Surface	41	$77,900			
	Grade, Drain, Bridge & Surface	10	$19,900			
	Enhancement	4	$9,400			
	Surface and Resurface	3	$5,700			
	Landscaping	1	$2,800			
	TOTAL	131	$307,400	15	$69,000	$376,400
2009	Bridges & Approaches	78	$211,200			
	Grade, Drain & Surface	37	$73,900			
	Widen and Resurface	17	$32,300			
	Grade, Drain, Bridge & Surface	14	$27,500			
	TOTAL	146	$344,900	16	$73,600	$418,500
2010	Bridges & Approaches	31	$83,200			
	Grade, Drain & Surface	20	$40,700			
	Grade, Drain, Bridge & Surface	12	$23,700			
	Surface & Reconstruct-Added Lanes	8	$15,200			
	TOTAL	71	$162,800	8	$36,800	$199,600
2011	Bridges & Approaches	20	$56,000			
	Grade, Drain & Surface	29	$56,000			
	Grade, Drain, Bridge & Surface	8	$15,200			
	Widen & Reconstruct-Added Lanes	11	$20,900			
	TOTAL	68	$148,100	5	$23,000	$171,100
2012	Bridges & Approaches	30	$80,400			
	Grade, Drain & Surface	23	$44,600			
	Grade, Drain, Bridge & Surface	18	$34,200			
	TOTAL	71	$159,200	7	$32,200	$191,400

*based on 17% of all projects in a given year requiring trap and relocation (T&R) as a result of positive detection ABB surveys.

habitat brought about by increased fragmentation, which leads to a reduced carrion prey base and an increase in vertebrate scavengers, all of which may be detrimental to the ABB (USFWS 1991).

The ABB is the largest species of its genus in North America, measuring one to 1.4 inches long. The hardened elytra are smooth, reflective black, and each elytron has two scallop shaped orange-red markings. The pronotum (hard back plate of the front portion of the thorax of insects) over the mid-section between the head and wings is circular in shape with flattened margins and a raised central portion. The most diagnostic feature of the ABB is the large orange-red marking on the raised portion of the pronotum, a feature shared with no other members of the genus in North America (USFWS 1991). The ABB also has orange-red frons and a single orange-red marking on the top of the head (triangular in females and rectangular in males). Antennae are large, with notable, orange club-shaped tips.

B. Life History

The ABB is an annual species and typically reproduces once in its lifetime. It competes with other invertebrate species, as well as vertebrate species, for carrion. Although ABBs are considered feeding habitat generalists, they are believed to be more selective regarding breeding habitat.

1. Summer Active Period

In Oklahoma, ABBs are typically active at night from mid-May to late-September when nighttime ambient temperatures are consistently above 60°F. Nightly activity is most prevalent from two to four hours after sunset (Walker and Hoback 2007). Weather events, such as rain and strong winds, result in reduced ABB activity. During the daytime ABBs are believed to bury under the vegetation litter. During late May and early June, ABBs secure a mate and carcass for reproduction. About 12 days afterward (once larvae enter pupae phase), adult ABBs emerge and search for food.

2. Winter Inactive Period

During the winter months, when the nighttime ambient temperature is consistently below 60°F, ABBs bury themselves into the soil and become inactive (USFWS 1991). In Oklahoma, this typically occurs in late September lasting until mid-May. Recent studies indicate that ABBs bury an average depth of 2.4 inches (Schnell *et al.* 2007). Habitat structure (i.e. woodland vs. grassland) does not appear to be an influencing factor.

Preliminary data suggest that overwintering results in significant mortality (Bedick *et al.* 1999). Winter mortality has only recently begun to be investigated, but may range from 25% to about 70% depending on year, location, and availability of carrion in the fall (Schnell *et al.* 2007; Raithel unpubl. Data 1996-2006).

3. Feeding

When not involved with brood rearing, adult food sources include an array of available carrion, as well as capturing and consuming live insects. *Nicrophorus* species are capable of finding a carcass between one and 48 hours after death at a distance up to two miles (Ratcliffe 1996). Success in finding carrion depends upon many factors, including availability of optimal habitats for small vertebrates (Lomolino and Creighton 1996), density of competing invertebrate and

vertebrate scavengers, individual searching ability, reproductive condition, and temperature (Ratcliffe 1996).

Adult ABBs in search of carrion move an average of 0.7 miles per night (Creighton and Schnell 1998). Creighton *et al.* (1993a) recorded ABBs traveling as much as two miles during one night. Creighton and Schnell (1998) found that the mean distance recaptured ABBs moved from their original site of capture was 1.66 miles, with a minimum distance of 0.01 mile in one night to a maximum distance 6.2 miles over a six night period. Bedick *et al.* (1999) indicated that ABBs may travel distances up to 3.72 miles in a single night.

By moving relatively long distances among different habitat types, ABBs increase the chance of encountering proper sized carcasses, but also increase exposure to a diversity of natural and unnatural sources of potential adverse impact, including predation, insecticides, commercially available insect traps, and nocturnal light pollution. The probability of individual ABBs being subjected to these types of hazards also increases as areas become more developed (Lomolino and Creighton 1996).

4. Habitat

ABBs are considered feeding habitat generalists and have been successfully live-trapped in several vegetation types, including undisturbed grasslands, grazed pasture, riparian zones, and oak-hickory forest, as well as in various soil types (Creighton *et al.* 1993b; Lomolino and Creighton 1996; Lomolino *et al.* 1995; NatureServe Explorer 2001; USFWS 1991). Rangewide, ecosystems supporting ABB populations are diverse and include primary forest, scrub forest, forest edge, prairie, riparian areas, mountain slopes, and maritime scrub communities (Ratcliffe 1996; USFWS 1991). In Arkansas and Oklahoma, ABBs are found within a mixture of vegetation types from oak-hickory and coniferous forests on lowlands, slopes, and ridgetops to deciduous riparian corridors and pasturelands in the valleys (USFWS 1991; Creighton et al. 1993b).

Soil conditions must be conducive to ABB excavation (Anderson 1982; Lomolino and Creighton 1996). Soils in the vicinity of captures are all well drained and include sandy loam and silt loam, with a clay component noted at most sites. Level topography and a well formed detritus layer at the ground surface are common (USFWS 1991).

At Camp Gruber, Oklahoma, Schnell and Hiott (2002a) reported more ABB captures within the installation than at the disturbed perimeters. Also, Schnell and Hiott (2002c) conducted surveys within Weyerhaeuser lands in southeast Oklahoma and southwest Arkansas where they reported fewer ABBs along roads than in the interior of tree plots. At Fort Chaffee in Arkansas, Schnell and Hiott (2005b) also noted that ABBs tended to avoid soils with less than 40 percent sand, greater than 50 percent silt, and greater than 20 percent clay.

5. Reproduction

For breeding, habitat preference studies in Oklahoma indicate ABBs select undisturbed, mature oak-hickory forests with substantial litter layers and deep, loose soils over grasslands or bottomland forests (Lomolino and Creighton 1996; Creighton *et al.* 1993b). In 1996 more than 300 specimens were captured in Nebraska habitats consisting of prairie, forest edge, and scrubland (Ratcliffe 1996). These surveys have found certain soil types, such as very xeric (dry), saturated, or loose sandy soils, to be unsuitable for carcass burial and thus are unlikely habitats.

Lomolino and Creighton (1996) found reproductive success to be higher in forested sites than grassland sites. Carcasses tended to be buried deeper in the soil at grassland sites, as compared to forested sites (e.g., just below the litter layer).

Reproductive activity occurs between mid May and mid August and commences once a suitable carcass is found on which to feed and lay eggs. Both parents often participate in the rearing of young with care by at least one parent, usually the female, which is critical for larval survival (Ratcliffe 1996). This is a rare and highly developed behavior in insects, known only among bees, ants, wasps, termites, and a few scarab beetle species. The pair buries appropriately-sized carrion, about 3.5-7.0 ounces in weight, within a brood chamber constructed around the carcass. Prior to carcass burial, ABBs may move the carrion laterally for up to three feet (USFWS 1991).

Eggs are laid in the soil beside the carcass. Brood sizes vary between 3-31 individuals (USFWS 1991), with a positive correlation between carrion weight and number of larvae (Kozol 1990). The larvae pupate and emerge as adults in about 48-60 days. Generally, the ABB produces only one brood per year and these newly hatched adults overwinter to reproduce the following year. Occasionally the emerging generation of adults succeeds in producing another brood if summers are long and warm (USFWS 1991).

C. Status and Distribution

At the time of listing in 1989, the prevailing theory on the ABB's decline was habitat fragmentation (USFWS 1991). Fragmentation of natural habitat that historically supported high densities of indigenous (native) species, coupled with increased direct taking (ca. 1900) of birds and other vertebrates, may have contributed to the decline of ABBs by changing the species composition and lowering the reproductive success of prey species required for ABB reproduction. Likewise, by increasing edge habitat, there may have been an attendant increase in the occurrence and density of vertebrate predators and scavengers, such as the American crow *Corvus brachyrhynchos*, raccoon *Procyon lotor*, fox *Vulpes* sp., opossum *Didelphis virginiana*, and skunk *Mephitis* sp., which compete with ABBs for available carrion.

In the Midwest, windbreaks, hedgerows, and park development have all provided new "edge" habitat for these scavengers, as well as for domestic and feral animals such as dogs and cats. All of these animals utilize carrion that may be suitable for ABBs (Ratcliffe 1996). In this way, fragmented habitats not only support fewer or lower densities of indigenous species that historically may have supported ABB populations, but there is more competition for those limited resources among the "new" predator/scavenger community.

Although much of the evidence suggesting the reduction of carrion resources as a primary mechanism of decline is circumstantial, this scenario fits the temporal and geographical pattern of the disappearance of ABBs, and is sufficient to explain why ABBs declined while congeneric species did not. Research has shown that in a fragmented ecosystem, larger species are negatively affected before smaller species, a process which has been well documented with carrion and dung beetles in South America (Klein 1989).

Since the publication of the ABB recovery plan, additional research has been conducted. Sikes and Raithel (2002) examined the literature from the last 20 years. They evaluated several possible threats to the ABB: DDT/pesticide use, artificial lighting, pathogens, habitat alteration,

habitat fragmentation, vertebrate competition, loss of ideal carrion, and congener competition. The paragraphs below discuss these threats.

The USFWS (1991) concluded that the best explanation for the decline of ABBs involved habitat fragmentation, which reduced the carrion prey base and increased the vertebrate scavenger competition for this prey. Kozol (1990), Ratcliffe (1996), Amaral *et al.* (1997), and Bedick *et al.* (1993) have reiterated this theme. The ABB is the largest species of *Nicrophorus* in the New World and require carcasses of 3.5 to 7.0 ounces (Kozol *et al.* 1988) to maximize fecundity (productivity), whereas all other *Nicrophorus* species can breed on the more abundant smaller carcasses of 0.11 to 0.18 ounces (Trumbo 1992).

Frequent low intensity and widespread fire, drought, and grazing by native herbivores were the principle historic and natural sources of disturbance within much of the historic range of the ABB, including the Action Area (McNab and Avers 1996). Fires removed most of the brush and young woody growth in forested areas, while retarding succession to woody vegetation in grasslands (The Nature Conservancy 2000, 2003a, 2003b). Fires also returned nutrients to the soil and stimulated the growth of grasses and forbs in prairie areas (The Nature Conservancy 2000). Other climatic influences within eastern Oklahoma included winter ice storms and spring tornadoes (McNab and Avers 1996).

Land conversion to agriculture and development, logging, fire suppression, and intensive domestic livestock grazing are the main causes of habitat loss and fragmentation within eastern Oklahoma today. Since European settlement, fires have been largely suppressed within eastern Oklahoma, leading to changes in community types and species composition. Riparian areas and bottomland habitats have been severely degraded not only as a result of conversion to agriculture and logging, but also because of inundation by numerous reservoirs (Ruth 2006). The anthropogenic breakdown of barriers to dispersal also has permitted the invasion of non-indigenous species (Northern Prairie Wildlife Research Center 2006).

Land use within eastern Oklahoma varies considerably and includes rangeland, pastureland, cropland (e.g., peanuts, soybeans, grain sorghum, small grains, hay, cotton, corn, wheat, pecans), livestock farming, poultry production, oil and gas production, logging and commercial pine plantations, mining, and outdoor recreation (Woods et al. 2005). The mining district near Picher, Oklahoma, in Ottawa County, was a primary source of lead and zinc mining in the U.S. during the first half of the 20th century. It is now abandoned and has become the Tar Creek Superfund site (Woods et al. 2005). Eastern Oklahoma has been highly impacted by the effects of agricultural conversion of arable lands, with nearly 51% of the Action Area having been tilled (U.S. Geological Survey 1990).

Urban centers occur within the Action Area, including the Tulsa metropolitan area, with over 900,000 residents (Wikipedia 2008), as well as several smaller cities with populations ranging from 10,000 to 40,000 residents. Impoundments and reservoirs are common throughout the Action Area, and include Eufaula Lake which has the largest surface area (102,200 acres) and the second largest volume (greater than 2.3 million acre-feet) in the state (Johnson 2007). There are over 900 impoundments within the Action Area, occupying approximately 680 mi^2 surface area and containing 3,602 miles of shoreline. There are currently 628 miles of interstate highways, 4,637 miles of primary roads and 56,595 miles of secondary roads within the Action Area (U.S. Geological Survey 1995).

Historically the geographic range of the ABB encompassed over 150 counties in 35 states, covering most of temperate eastern North America (USFWS 1991; Peck and Kalbars 1987, USFWS 2008). Records are known from Texas (single record c. 1935) in the south, north to Montana (single record in 1913) and the southern fringes of Ontario, Quebec, and as far east as Nova Scotia and Florida (Appendix 2). Documentation is not uniform throughout this broad historical range. More records exist from the Midwest into Canada and in the northeastern United States than from the southern Atlantic and Gulf of Mexico region (USFWS 1991).

During the 20th century, the ABB disappeared from over 90 percent of its historical range (Ratcliffe 1995). The last ABB specimens along the mainland of the Atlantic seaboard, from New England to Florida, were collected in the 1940's (USFWS 1991). In July 1989, the species was federally-listed as endangered based on its drastic decline and elimination over nearly its entire range (54 FR 29652). At the time of listing, known populations were limited to Block Island, Rhode Island, and a few counties in eastern Oklahoma.

Currently, the ABB is known to occur in only eight states: on Block Island off the coast of Rhode Island, Nantucket Island off the coast of Massachusetts, eastern Oklahoma, western Arkansas, the Sand Hills region in north-central Nebraska, the Chautauqua Hills region of southeastern Kansas (Sikes and Raithel 2002), south central South Dakota (Ratcliffe 1996; Bedick *et al.* 1993), and northeast Texas (Godwin 2003). Less than 7 percent of the land within the ABB range in Oklahoma exists in public ownership. Public landowners include the USFWS, U.S. Army Corps of Engineers, Bureau of Indian Affairs, Bureau of Reclamation, U.S. Department of Defense, U.S. Forest Service, Oklahoma Department of Wildlife Conservation, Oklahoma Department of Tourism, and Oklahoma State School Lands Commission (U.S. Geological Survey 1995).

Some private conservation lands owned by The Nature Conservancy within eastern Oklahoma also support ABB populations. Most existing populations, however, are located on private land. Populations known to exist on public land include: Ouachita National Forest, Arkansas / Oklahoma; Ozark-St. Francis National Forests, Arkansas; the McAlester Army Ammunition Depot and Defense Ammunition Center (MCAAP), Oklahoma; Camp Gruber, Oklahoma; Fort Chaffee, Arkansas; Sequoyah National Wildlife Refuge, Oklahoma; Block Island National Wildlife Refuge, Rhode Island; Valentine National Wildlife Refuge, Nebraska; and Camp Maxey, Texas.

D. Analysis of the Species/Critical Habitat Likely to be Affected

The ABB may potentially be affected on 5,999 acres throughout its range in Oklahoma by the implementation of the various transportation projects due to soil disturbance in ABB habitat. No critical habitat has been designated for the ABB; therefore, none will be affected.

III. Environmental Baseline

The environmental baseline is defined as the effects of past and ongoing human induced and natural factors leading to the current status of the species, its habitat, and ecosystem, within the Action Area. The environmental baseline is the snapshot of the status of the ABB at present.

A. Status of the Species Within the Action Area

Oklahoma counties with recently confirmed ABB sightings since 1992 (i.e., current range) are Atoka, Bryan, Cherokee, Choctaw, Coal, Craig, Haskell, Hughes, Johnston, Latimer, LeFlore, McCurtain, McIntosh, Muskogee, Okfuskee, Osage, Pittsburg, Pushmataha, Rogers, Sequoyah, Tulsa, and Wagoner (22 counties). Additional counties with historic ABB sightings in eastern Oklahoma (historic range) include, Creek, Mayes, Nowata, Okmulgee, Ottawa, and Washington (6 counties). Counties likely within the current ABB range, but where no recent or historic sightings have been recorded (i.e., potential range) include, Marshall, Pawnee, Pontotoc, and Seminole (4 counties). Unconfirmed recent ABB sightings since 1992 (i.e., also potential range) have been recorded in Adair and Delaware counties (2 counties, USFWS 2005c). The 22 confirmed counties represent approximately 40-50 percent of the current occupied range of the ABB.

Numerous ABB surveys have been conducted throughout eastern Oklahoma. The majority of these surveys are driven by the need to protect ABBs from specific soil disturbance actions associated with development projects. Therefore, most survey data is temporally and spatially random, with only a small portion of the survey data from standard survey efforts. Consequently, the number of trapnights varies among counties and years, ranging from 24 trap nights in Tulsa County to 17,388 in Muskogee County. Presently, eastern Oklahoma contains one large concentration of ABBs within their historic range, at Camp Gruber in Muskogee County. In 2007, a total of 676 ABBs were captured in 1,305 trapnights at Camp Gruber. Smaller concentrations of ABBs in Oklahoma include the MCAAP in Pittsburg County and the four-county area of Atoka, Coal, Hughes, and Pittsburg counties.

Structured survey data are collected annually or biennially from MCAAP, Camp Gruber, Ouachita National Forest, Connors State College, and Weyerhaeuser lands in Oklahoma. These surveys provide trend data for the ABB. Surveys for the ABB have been conducted annually at Camp Gruber since 1992, accounting for the high number of trap nights (17,388) in Muskogee County. The MCAAP has conducted surveys biennially since 1995. Ouachita National Forest (Forest) conducted annual surveys based on proposed soil disturbance activities from 1991 to 2005. Beginning in 2006 the Forest implemented standard transects to survey annually. Connors State College has an ABB conservation area where ABBs are surveyed biennially. Weyerhaeuser has land in McCurtain County and has conducted surveys since 1997. ABB captures at these locations typically fluctuate on an annual or biennial basis, but in general ABB numbers appear stable or increasing, with the exception of the Weyerhaeuser lands where the trend appears to be declining. All of these areas, except for Weyerhaeuser lands, provide large tracts of relatively natural habitat for the ABB.

B. Factors Affecting Species' Environment Within the Action Area

To adequately evaluate the effects of transportation activities throughout eastern Oklahoma on the ABB covered in this PBO, the USFWS must consider the individual and cumulative impacts from these activities. Additionally, the USFWS must also consider other, separate effects currently ongoing and likely to occur in the foreseeable future that also could have adverse impacts to the ABB within the Action Area.

Other Consultations

Between October 1, 2002, and September 30, 2003, the Oklahoma USFWS consulted on approximately 1,562 proposed actions of which 858 (55%) were proposed to be implemented in the 34 counties in which the ABB likely occurs. Project types evaluated included pipelines, roads, communication towers, residential housing development, bridges, mining, petroleum and natural gas exploration and production, commercial development, recreational development, transmission lines, and water and waste water treatment facilities. From October 1, 2003, to June 9, 2004, this office reviewed about 1,020 projects. Of this total, 438 projects (about 43%) were proposed within the 34 counties in Oklahoma where the ABB is believed to occur.

There are three current Biological Opinions (BO) with incidental take statements issued for the ABB in Oklahoma. One was issued to the Department of Defense pertaining to Camp Gruber near Braggs, Oklahoma; one to the U.S. Forest Service regarding the Forest in southeast Oklahoma; and one to the U.S. Army Corps of Engineers (Corps) for a specific project in Osage County. The BO for Camp Gruber allows for the take of 35 ABBs per year for the life of the project. The BO for the Forest covers forest lands in both Oklahoma and Arkansas, and allows for the take of 30 ABBs per year for 15 years. The BO for the Corps allows take of 76 acres of ABB habitat over the life of the project.

Permits

Currently 18 entities or individuals possess valid section 10 permits for the ABB in Oklahoma. Seventeen are section 10(a)(1)(A) scientific research permits to enhance the survival of the species, and one is an incidental take permit issued in conjunction with a Habitat Conservation Plan (HCP). Although 17 permits are enhancement of survival permits, some authorized take of ABBs can occur. The research conducted must further conservation efforts for the species. The loss of some individual ABBs over the short-term from research is allowed as long as the survival of the ABB is not jeopardized. The USFWS requires that every available precaution be implemented to reduce and/or eliminate authorized take associated with research activities.

The HCP and related 10(a)(1)(B) incidental take permit was issued in 1996 to Weyerhaeuser for ABBs on their lands in southeast Oklahoma. Habitat Conservation Plans with incidental take permits are available to private landowners, corporations, state or local governments, or other non-Federal entities who wish to conduct activities that might incidentally harm (or "take") a species listed as endangered or threatened. Before obtaining a permit, the applicant must develop an HCP, designed to minimize or mitigate any harmful effects the proposed activity might have on the species. The HCP process allows development to proceed while promoting listed species conservation.

The Weyerhaeuser HCP is valid for 35 years and identifies the following as foreseeable activities likely to be implemented by Weyerhaeuser over the period: 28,000 acres (average of 800 acres per year) of forest will potentially be harvested; 16 ponds constructed; 10 or fewer food plots planted; EPA-approved application of pesticides for control of pales weevil damage to planted pine seedlings; ROW vegetation control; 2 miles of road construction; 20 acres of mineral, oil or gas exploration; and no more than 600 acres of cattle grazing. From 1997 to 2006, Weyerhaeuser lands were surveyed for the ABB annually, and habitat sampling was conducted

to determine effects from timber management on ABBs. From 1997 to 2006, the following numbers of ABBs were captured: 106, 64, 26, 41, 16, 25, 85, 19, 0, and 0, respectively.

In addition, the USFWS may recommend that ABBs be trapped and relocated in certain instances. While these activities can have adverse impacts, the existing recovery permit provides for take which may occur. The extent of take is unknown prior to implementation of this type of activity. However, all accidental deaths are required to be reported to the USFWS. From 1997 to 2003 ABB incidental deaths varied from approximately 5 to 28 annually.

Other ABB Conservation Efforts Ongoing Within the Action Area

Northeastern State University and Camp Gruber are cooperating on an ABB Reproductive Microhabitat Study at Camp Gruber. The 2008 field season will be the third year of the project. Currently, no conclusive results have been documented due to low sample size. However, the 2008 study design has recently been modified to increase the sample size.

IV. Effects of the Action

It was not possible to precisely calculate the total amount of ABB habitat within the Action Area that could potentially be affected by ODOT activities. Therefore, the ROW minus existing pavement was used to estimate the number of acres of ABB habitat that could potentially be impacted by ODOT activities – 5,999 acres. This is a maximum estimate since actual impacts would be limited to the individual project footprints – an area usually considerably smaller than the ROW. Impacts to ABBs will be further minimized by trapping and relocating any ABBs found incidentally on project sites during construction activities. Proactive conservation measures for unavoidable permanent impacts is based upon the costs that would be associated with ABB surveys, and trap and relocations for individual projects.

A. Factors to be Considered

The proposed transportation projects will occur throughout the ABB's entire range in Oklahoma. These projects will be implemented throughout the year, meaning the ABB will be impacted during all phases of its lifecycle. Impacts will affect overwintering adults and reproductive broods through the direct loss of individual adults and larvae, and a decrease in ABB fecundity. The duration of impacts to the ABB will vary with the specific type of project, ranging from short-term to long-term to permanent. Further, individual projects will have components that vary in duration (e.g., a road would be a permanent impact but the construction ROW would be a short-term impact). Soil disturbing transportation projects have the potential to result in significant impacts to the ABB. The majority of the projects will result in a single one-time disturbance, but some maintenance type projects will cause multiple, though often minor, disturbances over the life of the project. Maintenance activities normally do not entail soil disturbance or at least only entail minimal soil disturbance. Almost all projects will result in the modification, loss, and/or fragmentation of ABB habitat.

B. Analyses for Effects of the Action

1. Beneficial Effects

The FHWA/ODOT proposes to facilitate long-term conservation for the ABB through contributions to the ABB Conservation Fund held by TNC and managed jointly by the USFWS and TNC. This fund is for the specific purposes of habitat acquisition, management, and research of conservation benefit to ABB recovery. The USFWS has identified priority conservation areas and recovery actions in Oklahoma for the ABB, as well as data gaps in the knowledge of their life history. The ABB Conservation Fund contribution is a means for FHWA/ODOT to provide more meaningful conservation of ABBs in response to transportation network improvements in eastern Oklahoma that adversely impact the ABB. This conservation approach allows FHWA/ODOT to address their impacts on ABB habitat, including the loss, modification, and fragmentation of habitat. In addition, this approach provides for research opportunities which will provide useful information to assist FHWA/ODOT in further minimizing their impacts to ABBs.

2. Direct Effects

Adverse impacts to ABBs can occur from ground disturbance associated with the proposed action. Construction activities related to roadway projects frequently disturb soils and have the potential to harm individuals. Direct adverse impacts to ABBs during their inactive and active periods may occur as a result of impacts from clearing vegetation, heavy equipment operation, fuel and chemical contamination of the soil, grading rough terrain, soil excavation and filling, and revegetation and reseeding of disturbed areas.

During routine roadway construction, soil is excavated to a depth of about 12 inches or more, depending upon site conditions. The overall permanent width of the ROW varies, depending upon the type of project, but can be as much as 300 feet or more. Excavating soils, clearing vegetation and grading the ROW and associated access roads will entail displacement of soils that could uncover ABBs. Uncovered ABBs could be exposed to predation, adverse environmental conditions or being crushed by equipment. If construction occurs during the active season, ABB broods could be displaced during soil excavation, adults could be separated from larvae/eggs and/or crushed by equipment. Revegetation activities could result in further disturbance.

Although ODOT will no longer be surveying project sites for ABBs prior to road construction activities, if ABBs are found during construction activities, the project will be halted to allow for trap and relocating or bait away procedures to be completed in accordance with ODOT Special Provisions 656-2 and guidance from the USFWS.

Use of heavy construction equipment, such as bulldozers, excavators, track hoes, and back hoes, could compact soils. This could result in destruction of ABB brood chambers, including adults and larvae, and cause soils to be unusable by ABBs for carcass burial during the reproductive season. If construction takes place during the winter season, adult individuals could be crushed and/or ABB re-emergence in late spring or early summer could be prohibited. The accidental spilling of petroleum products and chemicals could contaminate the soil, creating unsuitable habitat and directly killing individuals and/or broods, or displacing individuals to less suitable areas.

Maintenance activities occur continuously from the time of completion of construction. Clearing and maintaining the ROW could alter the habitat by precluding re-establishment of the natural vegetative community. This could potentially displace ABBs to other less suitable areas. Repairs and/or upgrades to the ROW cannot be predicted. Periodic maintenance and occasional repair of the surface structures, however, is usually required. Those maintenance and repair activities that require surface disturbance involving excavation may result in periodic disturbance of the habitat and could result in direct mortality of individual ABBs inhabiting the soil. The periodic use of heavy equipment for maintenance of the ROW may result in soil compaction, reducing the ability of ABBs to bury the carrion or emerge from hibernation. Chemical use for weed eradication also might negatively impact ABBs.

2. Indirect Effects

Indirect effects are those project related effects which are reasonably certain to occur, but later in time. The ABB can be indirectly affected by limitation or reduction in available carrion; harassment during breeding, brood rearing or overwintering; or the loss, fragmentation, and alteration of suitable habitat. Although the ABB appears to use various habitat types, the role of vegetation composition and soil type as limiting factors is unclear. However, the creation of edge habitat may result in unsuitable habitat conditions for the ABB and potentially lead to increased competition for prey resources and scavengers. Predators, such as feral and domestic dogs and cats, crows, coyotes, foxes, skunks, opossums, or raccoons, are opportunistic feeders and can compete with the ABB for available carrion. These species thrive along edge habitats. Furthermore edge habitat alters the microenvironments, which potentially affect the ABB.

Roadway construction on new alignment results in increased edge habitat and habitat fragmentation. Widening of existing roadways results in additional loss of ABB habitat. This is likely to result in take of ABBs, in the form of harm, by lowering the availability of appropriate prey for ABBs, reducing reproduction, increasing predation, and increasing mortality from vehicle strikes.

In National Wildlife Federation v. Coleman, 529 F.2d 359 (5th Cir., 1976), the court ruled that indirect effects of private development resulting from proposed highway construction had to be considered as impacts of a proposed federal highway project. The only new highway construction projects currently proposed in the Action Area are the US-70 Durant and Valiant Interchanges in Bryan and McCurtain counties. The proposed bypasses are approximately 13 miles in length and 4 lanes wide. Based on this information, the FHWA/ODOT estimated that about 20 acres (40 businesses at 0.5 acres each) would be developed by other parties.

Typical vegetation maintenance of roadway ROWs consists of mowing. However, in some instances herbicides are applied around guard rails and other obstacles where mowing is difficult, and to spot treat exotics and invasive species. Both actions eliminate potential suitable habitat for the ABB and could reduce their prey base by eliminating vertebrate food and cover. Although information on bio-accumulation of herbicides in carrion beetles is unavailable, this factor may influence survival of ABBs.

V. Cumulative Effects

Cumulative effects are those effects of future, non-federal state, tribal, local government, and private actions that are reasonably certain to occur in the Action Area considered in this PBO.

Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

In addition to those projects with a federal nexus that undergo consultation, there are numerous actions that do not require federal funding, permitting, or authorization and consequently do not require consultation with the USFWS. The USFWS assumes that if there are roughly 1,000 to 1,500 projects annually with a federal nexus for which we consult; there are at least this many or more nonfederal nexus projects that are implemented in the Action Area.

There are over 400 new oil and gas wells constructed annually, on average, in eastern Oklahoma, with the majority not having a federal nexus. Additionally, numerous oil and gas seismic surveys and pipelines are constructed throughout the project area. There are multiple new or expanding surface coal mines in southeastern Oklahoma. Commercial development is expanding to undeveloped lands on the periphery or in suburbs of cities. Residential developments are being constructed outside city limits or in previously undeveloped or rural areas. The specific numbers of projects or associated acres of disturbance is difficult if not impossible to quantify. However, it is clear that there are numerous, continuing, and expanding impacts to ABBs and their habitat from nonfederal nexus projects.

VI. Conclusion

After reviewing the current status of the ABB, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the USFWS's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the ABB. No critical habitat has been designated for this species; therefore, none will be affected.

While the ABB has disappeared from approximately 90 percent of its historic range, there are self-sustaining populations in Oklahoma, Arkansas, Nebraska, Kansas, South Dakota, and Massachusetts. Further, there are multiple secure conservation areas (e.g., Camp Gruber, TNC lands, and Forest) where the ABB is known to occur in Oklahoma and the conservation goals and/or ownerships of these areas are not likely to change. The proposed actions impact roughly 0.04 percent of the total area of eastern Oklahoma and the impacts are expected to be relatively small and isolated. Furthermore, some of the anticipated impacts would be temporary in duration. In addition, the contribution to the ABB Conservation Fund will provide long-term net conservation benefits to the ABB.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by ODOT on behalf of the FHWA so that they become binding conditions for any action, grant, or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If ODOT (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, ODOT must report the progress of the action and its impact on the species to the USFWS as specified in this Incidental Take Statement. [50 CFR §402.14(i)(3)].

Amount or Extent of Take Anticipated

Take of the ABB is anticipated, both directly and indirectly, from implementation of the proposed projects. The precise number of ABB which could be taken is difficult to quantify because population levels fluctuate annually and the actual extent to which ABB habitat would be altered is unknown. Consequently, the Service cannot provide a precise measure of the number of ABBs that would be taken. Additionally, the actual take would be difficult to detect for the following reasons: 1) the ABB has a small body size making finding a dead or impaired individual unlikely; and 2) the ABB spends a substantial portion of their lifespan underground. However, the USFWS believes the amount of habitat altered during project implementation serves as a suitable surrogate for estimating the level of take.

Based upon estimates by FHWA/ODOT detailed in the PBA, information exchange between ODOT and USFWS staff, and a review of publicly available information and scientific literature, it is anticipated that incidental take may occur within a maximum of 5,999 acres of the Action Area in the form of killing, harming and/or harassing over the next 5 years.

Effect of the Take

In the accompanying PBO, the USFWS determined that the level of anticipated take is not likely to result in jeopardy to the ABB.

REASONABLE AND PRUDENT MEASURES

The USFWS believes the following non-discretionary reasonable and prudent measures are necessary and appropriate to minimize take of the ABB.

1. Avoid utilizing plants listed as invasive by the U.S. Department of Agriculture or the state of Oklahoma.
2. Avoid or minimize, and immediately correct, soil loss due to erosion.
3. Restrict the type and application rate of all pesticides (including herbicides).
4. Monitor the level of disturbance.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the following terms and conditions must be implemented, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary and also must be a condition of any federal permits, contracts, or grants issued.

1. All plants listed on the U.S. Department of Agriculture's and the state of Oklahoma's invasive species list are prohibited from planting. The eastern red cedar is a native species to eastern Oklahoma. However, it is an invasive species due to fire suppression. The eastern red cedar, while native to the project area, is now considered invasive and is not to be planted.
2. Disturbed areas are to be restored and revegetated immediately. Top soil should be set aside and redistributed across newly restored sites to maintain soil integrity.
3. A list of all pesticides to be utilized during transportation project construction and maintenance activities should be provided to the Service. Only pesticides approved by the Service are allowed for application in areas of concern for the ABB. Pesticide use should adhere to label application rates.
4. A monthly report should be provided to the USFWS's Oklahoma Ecological Services Field Office summarizing project status. This report should be compiled in spreadsheet form, submitted electronically, and include all the information stipulated in Appendix 3 of this PBO.

Conservation Recommendations

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The conservation recommendations listed below are discretionary agency activities to minimize or avoid adverse impacts of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information needed to conserve the species.

1. Conduct research on the ABB coordinated with the USFWS.
2. Mow ROWs during the ABBs inactive period (September 20 to May 20).
3. Avoid the use of chemicals from mid May to September. Pesticide (including herbicides, rodenticides, fungicides, etc.) and chemical use should be limited to that necessary to protect the health and safety of personnel and property. All chemicals should be hand applied to limit the area of effect. Exceptions may be made in those cases with potentially severe habitat loss due to pest infestations.

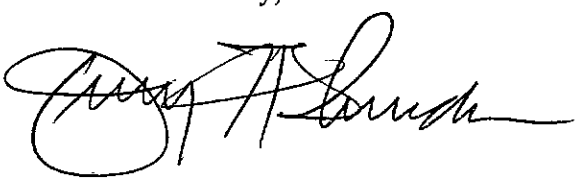
In order for the USFWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the USFWS requests notification of the implementation of any conservation recommendations.

Reinitiation Notice

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If further assistance or information is required, please contact Hayley Dikeman or me at the above address or telephone (918) 581-7458.

Sincerely,



Jerry J. Brabander
Field Supervisor

cc: Regional Director, FWS, Albuquerque, NM

LITERATURE CITED:

Amaral, M., A. J. Kozol, and T. French. 1997. Conservation strategy and reintroduction of the endangered American burying beetle. Northeastern Naturalist 4(3): 121-132.

Anderson, R.S. 1982. On the decreasing abundance of *Nicrophorus americanus* Olivier (Coleoptera: Silphidae) in eastern North America. The Coleopterists Bulletin 36:362-365.

Bedick, J.C., B.C. Ratcliffe, W.W. Hyatt, and L.G. Higley. 1993. Distribution, ecology, and population dynamics of the American burying beetle [*Nicrophorus americanus,* Olivier (Coleoptera, Silphidae)] in south-central Nebraska, USA. Journal of Insect Conservation 3:171-181.

Bedick, Jon C., Brett C. Ratcliffe, W. Wyatt Hoback and Leon G. Higley. 1999. Distribution, ecology and population dynamics of the American burying beetle *Nicrophorus americanus* Olivier (Coleoptera, Silphidae)] in South-central Nebraska, USA. Journal of Insect Conservation 3(3): 171-181.

Creighton, J.C., M.V. Lomolino, and G.D. Schnell. 1993a. Survey methods for the American burying beetle, *Nicrophorus americanus,* in Oklahoma and Arkansas. Oklahoma Biological Survey, Norman, Oklahoma.

Creighton, J.C., C.C. Vaughn, and B.R. Chapman. 1993b. Habitat preference of the endangered American burying beetle (*Nicrophorus americanus*) in Oklahoma. The Southwestern Naturalist 38:275-277.

Creighton, J.C. and G. Schnell. 1998. Short-term movement patterns of the endangered American burying beetle *Nicrophorus americanus*. Biological Conservation 86:281-287.

Duck, L. G. and J. B. Fletcher. 1943. A survey of the game and furbearing animals of Oklahoma. Div. Wildl. Restor. and Res., Oklahoma Game and Fish Comm., Pitman-Robertson Ser. No. 2, State Bull. No. 3. Oklahoma City.

Godwin, William B. 2003. Report of the discovery of the American burying beetle (*Nicrophorus americanus* Oliver) at the Camp Maxey, Texas Army National Guard facility, Lamar County, Texas.

Federal Highway Administration. 2008. Programmatic Biological Assessment For Future Transportation Improvement Projects Identified in 34 Counties of Eastern Oklahoma and their Effects to the American Burying Beetle. Oklahoma City. 32 pp.

Johnson, K. S. 2007. Oklahoma Historical Society's Encyclopedia of Oklahoma History and Culture: Lakes and Reservoirs. http://digital.library.okstate.edu/encyclopedia/entries/L/LA010.html.

Klein, B.C. 1989. Effects of forest fragmentation on dung and carrion beetle communities in Central Amazonia. Ecology 70:1715-1725.

Kozol, A.J. 1990. *Nicrophorus americanus* 1989 laboratory population at Boston University. Unpublished report prepared for the U.S. Fish and Wildlife Service.

Kozol, A.J., M.P. Scott, and J.A. Traniello 1988. The American burying beetle: studies on the natural history of an endangered species. Psyche 95: 167-176.

Lomolino, M. V. and J. C. Creighton. 1996. Habitat selection, breeding success and conservation of the endangered American burying beetle, *Nicrophorus americanus*. Biological Conservation 77:235-241.

Lomolino, M. V., J. C. Creighton, G.D. Schnell, and D. L. Certain. 1995. Ecology and conservation of the endangered American burying beetle, *Nicrophorus americanus*. Conservation Biology 9:605-614.

McNab, W. H. And P.E. Avers (compiled by) 1996. Ecological Subregions of the United States. U.S.F.S. WO-WSA-5. http://www.fs.fed.us/land/pubs/ecoregions/index.html.

NatureServe Explorer. 2001. Version 1.6. Arlington, Virginia, USA: NatureServe. Available: http://www.natureserve.org/explorer.

Northern Prairie Wildlife Research Center. 2006. Regional Trends of Biological Resources — Grasslands Prairie Integrity and Legacies Intercommunity Management: Prairie Integrity. http://www.npwrc.usgs.gov/resource/habitat/grlands/integrty.htm.

Peck, S. B. and M. M. Kaulbars. 1987. A synopsis of the distribution and bionomics of the carrion beetles (Coleoptera: Silphidae). Proceedings of the Entomological Society of Ontario. 118:47-81.

Raithel, C. J. 1996-2006. Monitoring and management of American burying beetles in Rhode Island. Section 6 Performance Reports, no. E-17-27 submitted to USFWS, Hadley, MA.

Raithel, C. J. 2002. Monitoring and management of American burying beetles in Rhode Island. Section 6 Performance Reports, no. E-17-27 submitted to USFWS, Hadley, MA.

Ratcliffe B. 1995. Nebraska's threatened and endangered species: American burying beetle. Nebraska Games and Parks commission.

Ratcliffe, B.C. 1996. The carrion beetles (Coleoptera: Silphidae) of Nebraska. Bulletin of the Nebraska State Museum Vol. 13.

Ruth, J. M. 2006. Partners in Flight – U.S. Website. Served by the USGS PatuxentWildlife Research Center, Laurel, Maryland, USA. http://www.partnersinflight.org.

Schnell, G.D. and A.E. Hiott. 2002a. American burying beetle survey, Camp Gruber, Oklahoma. Sam Noble Oklahoma Museum of Natural History, Norman, Oklahoma.

Schnell, G.D. and A.E. Hiott. 2002b. American burying beetle survey, Fort Chaffee, Arkansas. Sam Noble Oklahoma Museum of Natural History, Norman, Oklahoma.

Schnell, G.D. and A.E. Hiott. 2002c. American burying beetle survey, Weyerhaeuser lands, Oklahoma and Arkansas. Sam Noble Oklahoma Museum of Natural History, Norman, Oklahoma.

Schnell, G.D., A. E. Hiott, J.C. Creighton, V.L. Smyth, and A. Komendat. 2007. Factors affecting overwinter survival of the American burying beetle, *Nicrophorus americanus* (Coleoptera: Silphidae). Journal of Insect Conservation DOI 10.1007/s10841-007-9086-5

Sikes, D.S. and Christopher J. Raithel. 2002. A review of hypotheses of decline of the endangered American burying beetle (Silphidae: *Nicrophorus americanus* Olivier). Journal of Insect Conservation 6:103-113.

The Nature Conservancy, Osage Plains/Flint Hills Prairie Ecoregional Planning Team. 2000. Ecoregional Conservation in the Osage Plains/Flint Hills Prairie. The Nature Conservancy, Midwestern Resource Office, Minneapolis, MN. 48 pp + 73 appendices.

The Nature Conservancy, Ozarks Ecoregional Assessment Team. 2003a. Ozarks Ecoregional Conservation Assessment. Minneapolis, MN: The Nature Conservancy Midwestern Resource Office. 48 pp. +5 appendices.

The Nature Conservancy, Ouachita Mountains Ecological Assessment Team. 2003b. Ouachita Mountains Ecological Assessment. Little Rock, AR: The Nature Conservancy Arkansas Field Office. 41 pp.

Trumbo, S.T. 1992. Monogamy to communal breeding: exploitation of a broad resource base by burying beetles (*Nicrophorus*). Ecological Entomology 17:289-298.

U.S. Fish and Wildlife Service. 1991. American Burying Beetle Recovery Plan. U.S. Fish and Wildlife Service, Newton Corner, Massachusetts.

U. S. Fish and Wildlife Service. 2005a. USFWS consultation letter from Mr. Jerry Brabander to Mr. John Dyer/ODOT (FWS/R2/OKES/02-14-) dated June 8, 2005.

U.S. Fish and Wildlife Service. 2005b. Programmatic Biological Opinion for the Endangered American Burying Beetle (*Nicrophorus americanus*) for Federal Highway Administration Projects in the State of Arkansas. Arkansas Field Office. 32 pp.

U.S. Fish and Wildlife Service 2005c. Current Range of The American Burying Beetle in Oklahoma. http://www.fws.gov/southwest/es/Oklahoma/beetle1.htm

U.S. Fish and Wildlife Service 2008. ABB Conservation Strategy in Oklahoma. Oklahoma Ecological Services Field Office. Unpublished.

U.S. Geological Survey. 1990. Land Use and Land cover digital data from 1:250,000 and 1:100,000 scale maps. National Mapping program, Technical Instructions Data Users Guide 4.

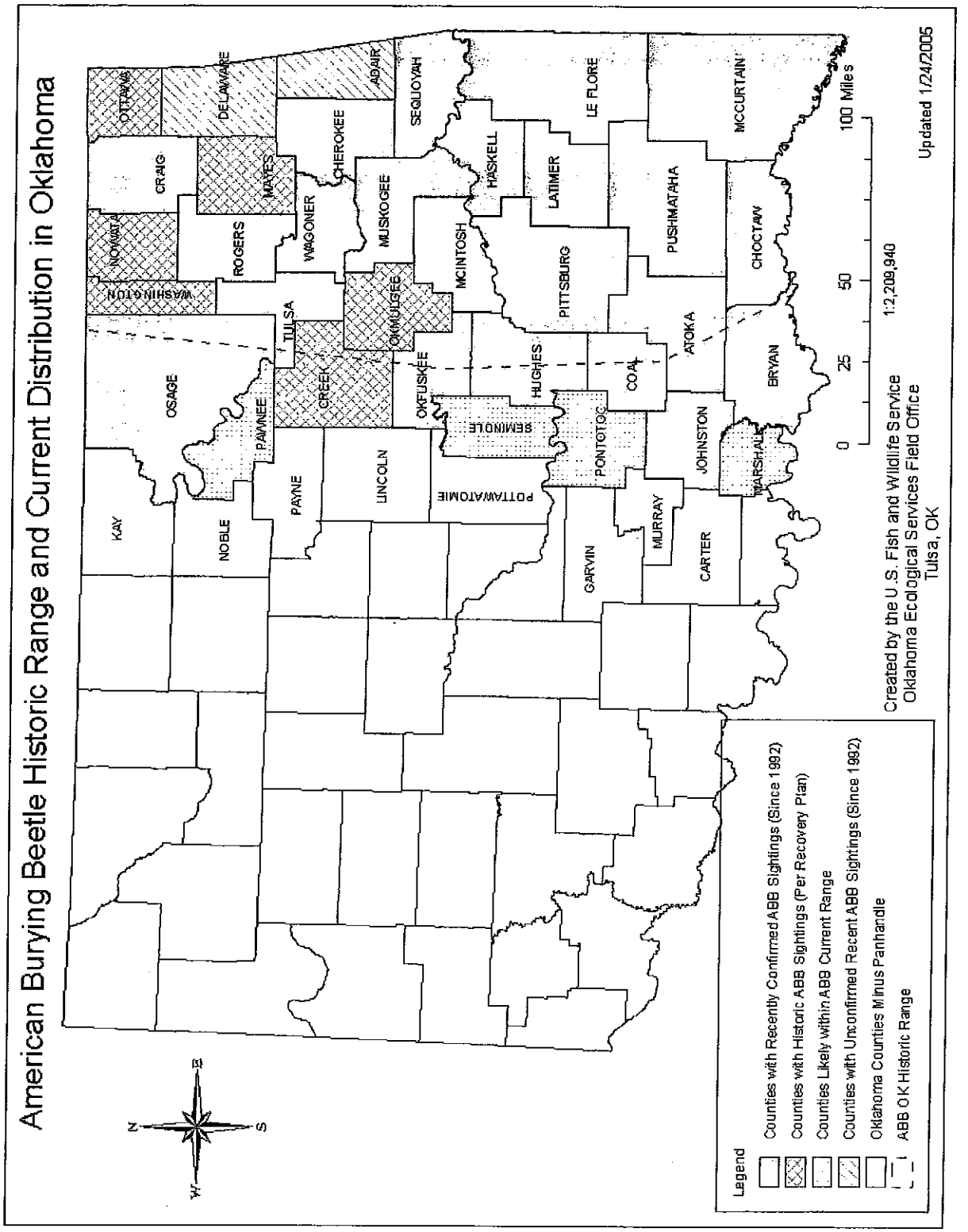
U.S. Geological Survey. 1995. Digital Atlas of Oklahoma. U.S. Geological Survey Open-File Report 97-23. http://ok.water.usgs.gov/gis/digatlas/index.html.

Walker,T. l. and W. Hoback. 2007. Effects of invasive eastern red cedar on capture rates of *Nicrophorus americanus* and other Silphidae. Env. Entolol. 36(2) 297-307.

Wikipedia. 2008. Tulsa Metropolitan Area. http://en.wikipedia.org/wiki/Tulsa_Metropolitan_ Area

Woods, A. J., J. M. Omernik, D. R. Butler, J. G. Ford, J. E. Henley, B. W. Hoagland, D. S. Arndt, and B. C. Moran. 2005. Ecoregions of Oklahoma (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,250,000).

Appendix 1. Historic and current range of the American burying beetle in Oklahoma.



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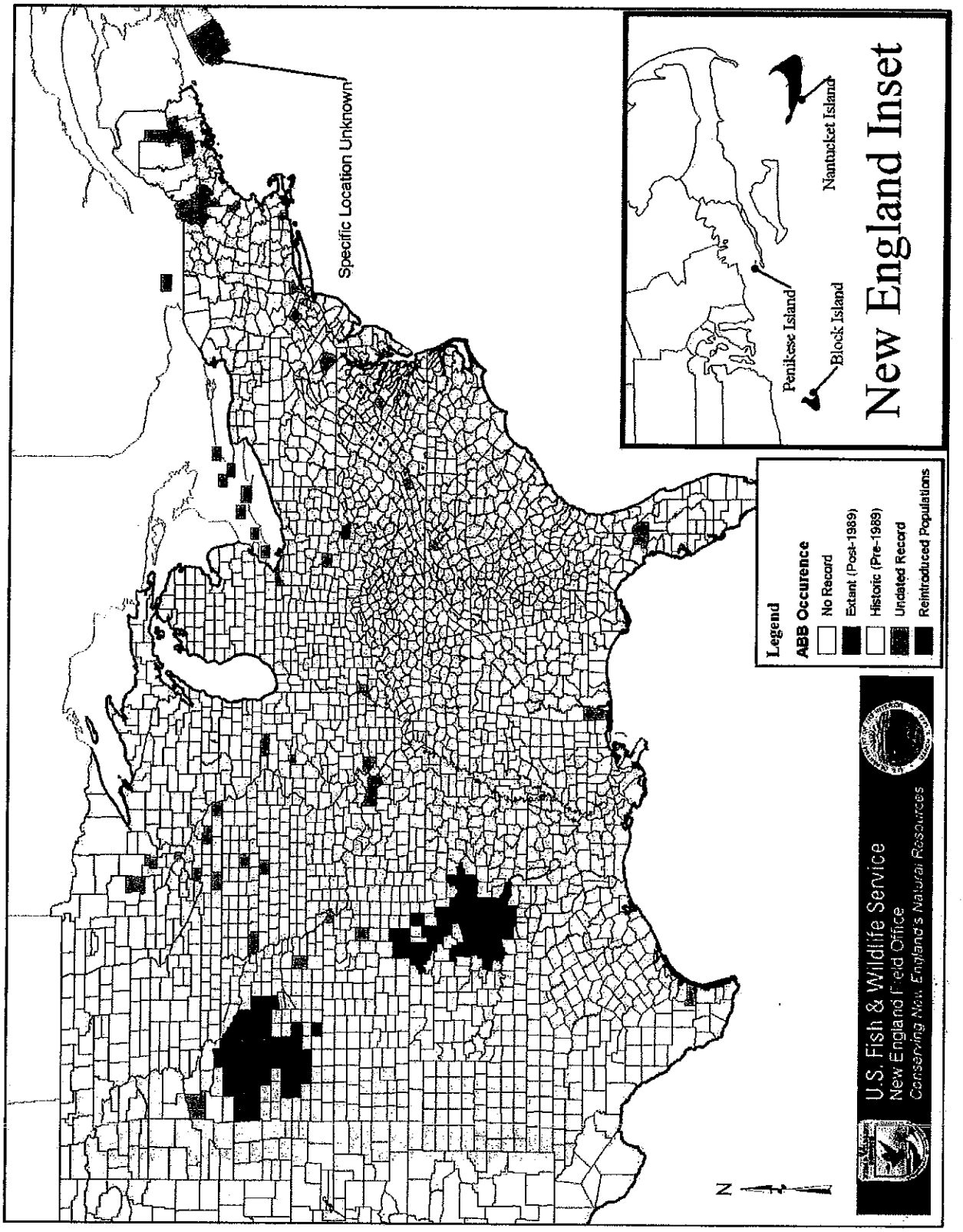

Appendix 3. Monthly report form for ODOT to submit to the USFWS.

Job Piece	ODOT Division	County	Transportation System	Let Date	Construction Start Date	Construction End Date	Work Description	Job Piece Description	Latitude	Longitude
Project Status	Projected Project Acreage	Projected Disturbance Acreage	Projected Suitable ABB Habitat Acreage	Final Project Acreage	Final Disturbance Acreage	Final Suitable ABB Habitat Acreage	Additional Conservation Measures Implemented (e.g. carrion removal, T&R, etc.)			

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Header Name	Header Description
Job Piece	e.g. 21716(04)
ODOT Division	
County	County or counties project is in
Transportation System	State System, County Improvements for Roads and Bridges (CIRB), and Local Government (LG
Let Date	Date let out for bid
Construction Start Date	Date project construction started
Construction End Date	Date project construction ended
Work Description	e.g. new bridge, replace bridge on new alignment, replace bridge on existing alignment, new 2 lane road, widening existing 2 lane to a 4 lane, etc.
Job Piece Description	
Latitude	Decimal Degrees, NAD 83
Longitude	Decimal Degrees, NAD 83
Project Status	e.g. Let, construction started, construction finalized
Projected Project Acreage	Projected acreage of new disturbance, not including existing facilites
Projected Disturbance Acreage	Projected acreage of newly-disturbed areas, areas outside existing ROW
Projected Suitable ABB Habitat Acreage	Projected acreage of new disturbance with suitable ABB habitat
Final Project Acreage	Final acreage of new disturbance, not including existing facilites
Final Disturbance Acreage	Final acreage of newly-disturbed areas, areas outside existing ROW
Final Suitable ABB Habitat Acreage	Final acreage of new disturbance with suitable ABB habitat
Additional Conservation Measures Implemented (e.g. carrion removal, T&R, etc.)	measures implemented in addition to the ABB Conservation Fund donation to avoid, minimize or conserve the ABB (e.g. carrion removal, trap and relocation)

Schnell, G.D. and A.E. Hiott. 2002c. American burying beetle survey, Weyerhaeuser lands, Oklahoma and Arkansas. Sam Noble Oklahoma Museum of Natural History, Norman, Oklahoma.

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Wikipedia. 2008. Tulsa Metropolitan Area. http://en.wikipedia.org/wiki/Tulsa_Metropolitan_Area

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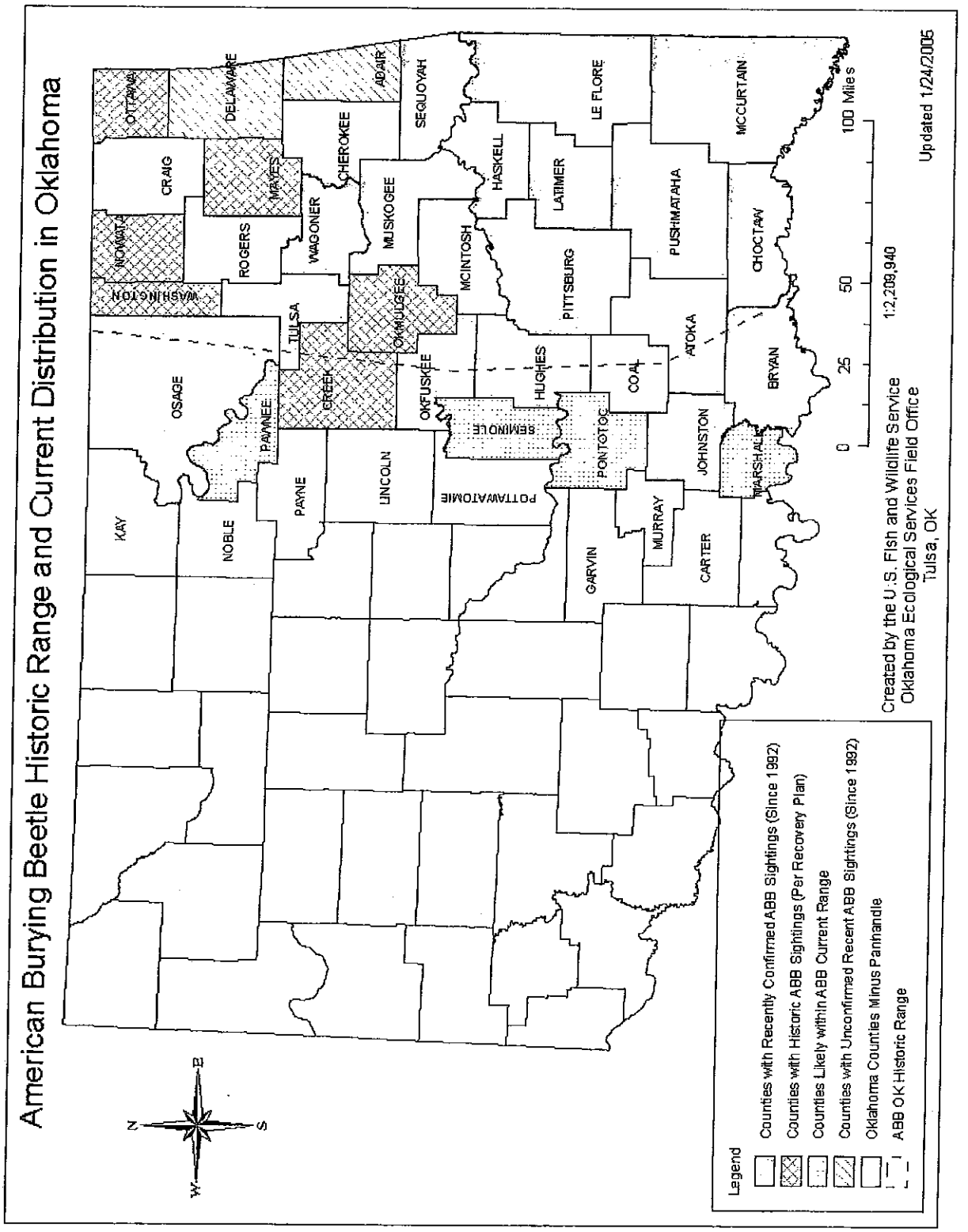
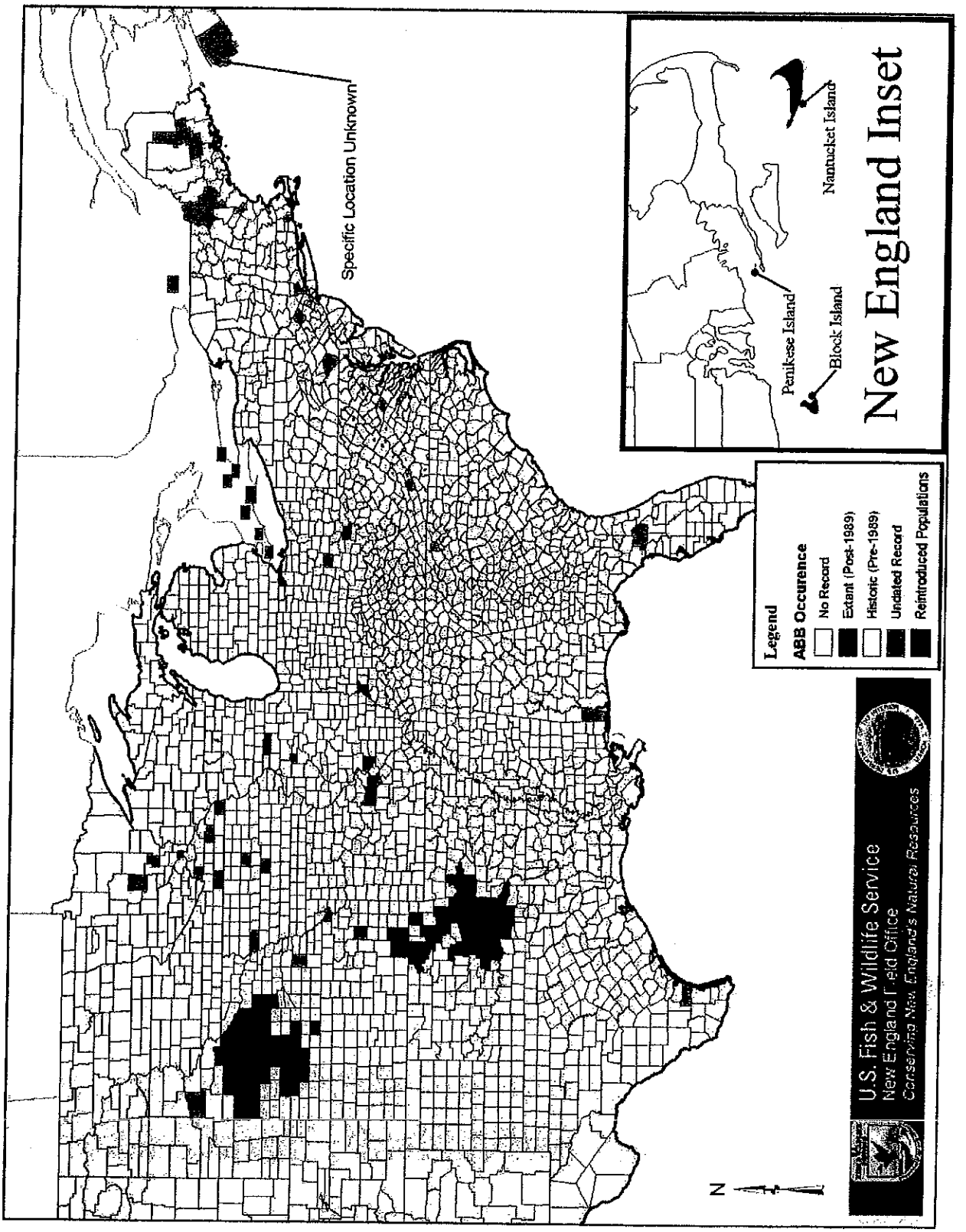


Appendix 2. Historic and current range of the American burying beetle.



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Construction Start Date	Date project construction started
Construction End Date	Date project construction ended
Work Description	e.g. new bridge, replace bridge on new alignment, replace bridge on existing alignment, new 2 lane road, widening existing 2 lane to a 4 lane, etc.
Job Piece Description	
Latitude	Decimal Degrees, NAD 83
Longitude	Decimal Degrees, NAD 83
Project Status	e.g. Let, construction started, construction finalized
Projected Project Acreage	Projected acreage of new disturbance, not including existing facilites
Projected Disturbance Acreage	Projected acreage of newly-disturbed areas, areas outside existing ROW
Projected Suitable ABB Habitat Acreage	Projected acreage of new disturbance with suitable ABB habitat
Final Project Acreage	Final acreage of new disturbance, not including existing facilites
Final Disturbance Acreage	Final acreage of newly-disturbed areas, areas outside existing ROW
Final Suitable ABB Habitat Acreage	Final acreage of new disturbance with suitable ABB habitat
Additional Conservation Measures Implemented (e.g. carrion removal, T&R, etc.)	measures implemented in addition to the ABB Conservation Fund donation to avoid, minimize or conserve the ABB (e.g. carrion removal, trap and relocation)